

THE BURDEN OF INJURIES AND VIOLENCE IN NORTH CAROLINA

Injury was the fourth leading cause of death for all North Carolinians in 2007. For younger people (ages 1 to 48), injury is the number-one cause of death.¹ Violence is the second (homicide) and third (suicide) leading cause of death for 15-to-24-year-olds.¹

The two major categories that define injury data are *intentional* and *unintentional*. Intentional injuries result from interpersonal or self-inflicted violence, and include homicide, assaults, suicide and suicide attempts, child abuse and neglect (includes child sexual abuse), intimate partner violence, elder abuse, and sexual assault. Unintentional injuries include, but are not limited to, those that result from motor vehicle crashes, falls, fires, poisonings, drownings, suffocations, choking, and recreational and sports-related activities. In terms of injury-related deaths, intentional injuries generally account for one-third of the deaths, while unintentional injuries account for two-thirds of the deaths.

The economic burden of injury and violence in North Carolina is enormous. All told, the cost of injury exceeds \$27 billion per year. This number encompasses fatal and non-fatal injuries' direct medical costs (\$1.2 billion), work-loss costs (\$6.8 billion), and quality of life costs (\$19.4 billion). The costs associated with injury and violence are truly staggering. Among North Carolinians aged 45 to 64, total costs from fall injuries alone were over \$1 billion in 2005. For residents aged 20 to 44, death from violence, both self-inflicted and assault, cost \$3.8 million in direct medical costs alone. Non-fatal injuries suffered by victims of assault add up to a cost of \$625 million per year.^{2,3}

Injury data in North Carolina are collected by many agencies, using a variety of systems. Injury surveillance and analysis is primarily conducted by the Injury Epidemiology and Surveillance Unit of the DPH's IVPB. Death data are obtained from vital statistics records through the N.C. State Center for Health Statistics. Hospitalization data come from the N.C. State Center for Health Statistics' hospital discharge data set. The emergency department dataset is obtained from the North Carolina Disease Event Tracking and Epidemiologic Collection Tool (N.C. DETECT).



Figure 1: Six Leading Causes of Death, North Carolina
2001-2006, All Races, Both Sexes

RANK	AGE GROUPS										
	>1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	All Ages
1	Short Gestation 1,195	Unintentional Injury 294	Unintentional Injury 242	Unintentional Injury 309	Unintentional Injury 3,311	Unintentional Injury 2,964	Unintentional Injury 3,575	Malignant Neoplasms 9,625	Malignant Neoplasms 18,728	Heart Disease 85,274	Heart Disease 108,633
2	Congenital Anomalies 1,083	Congenital Anomalies 86	Malignant Neoplasms 80	Malignant Neoplasms 91	Homicide 989	Homicide 975	Malignant Neoplasms 2,930	Heart Disease 7,221	Heart Disease 12,442	Malignant Neoplasms 66,505	Malignant Neoplasms 98,939
3	SIDS 587	Homicide 66	Congenital Anomalies 32	Homicide 42	Suicide 752	Suicide 939	Heart Disease 2,667	Unintentional Injury 3,248	Chronic Low. Respiratory Disease 2,502	Cerebro-vascular 25,874	Cerebro-vascular 30,251
4	Maternal Pregnancy Comp. 445	Malignant Neoplasms 57	Heart Disease 30	Suicide 41	Malignant Neoplasms 226	Malignant Neoplasms 690	Suicide 1,330	Cerebro-vascular 1,390	Cerebro-vascular 2,192	Chronic Low. Respiratory Disease 19,356	Unintentional Injury 23,271
5	Placenta Cord Membranes 269	Heart Disease 39	Homicide 27	Congenital Anomalies 36	Heart Disease 204	Heart Disease 620	HIV 965	Suicide 1,252	Diabetes Mellitus 2,174	Alzheimer's Disease 12,622	Chronic Low. Respiratory Disease 22,866
6	Bacterial Sepsis 204	Influenza & Pneumonia 22	Chronic Low. Respiratory Disease 10	Heart Disease 31	Congenital Anomalies 99	HIV 402	Homicide 707	Liver Disease 1,183	Unintentional Injury 1,916	Diabetes Mellitus 9,597	Diabetes Mellitus 13,522

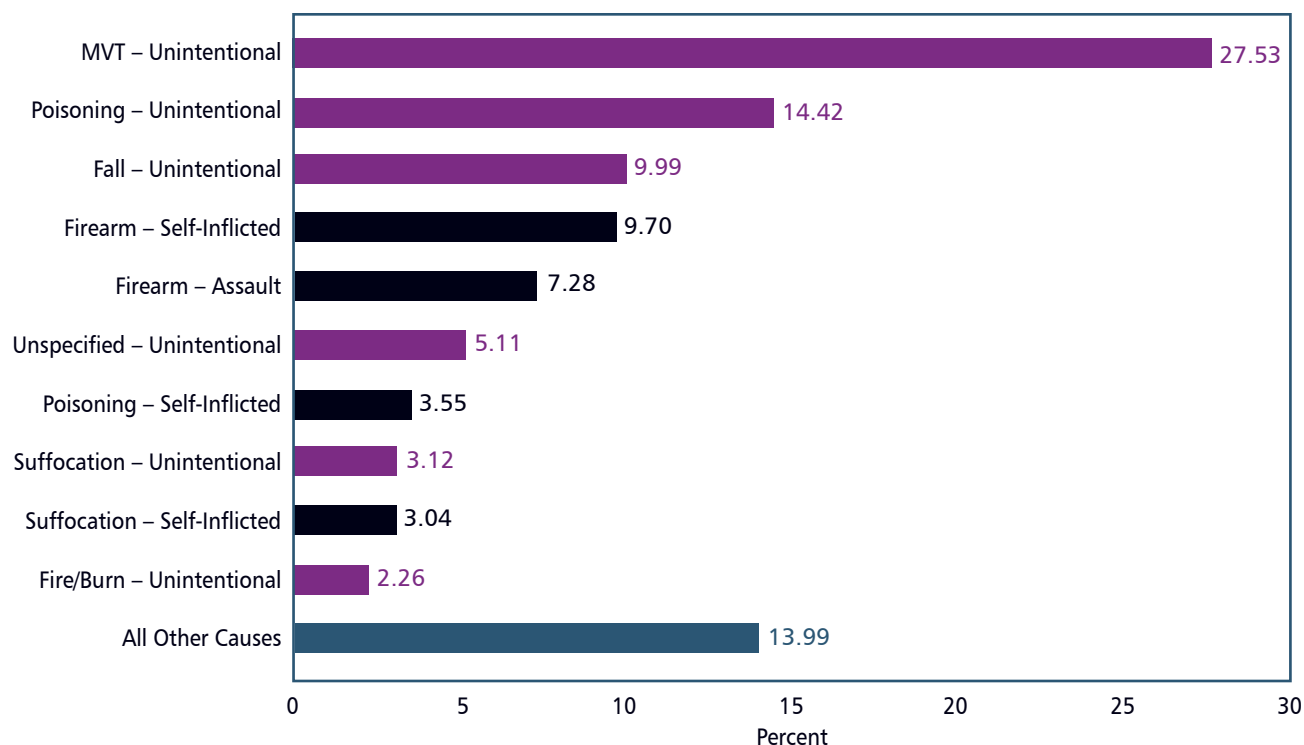
WISQARS™ Produced By: Office of Statistics and Programming, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention

Data Source: National Center for Health Statistics (NCHS), National Vital Statistics System

Both intentional and unintentional injuries make frequent appearances in the chart of leading causes of death. Unintentional injury, which includes motor vehicle crashes, poisonings, falls and fires/burns, is the number-one cause of death for people in the first four decades of life. Most startling, Figure 1 shows that injury is in the

top six causes of death for all North Carolinians ages one and older. As stated by the National Academy of Sciences in the 1988 report *Injury Control*, "Injury is probably the most under-recognized major public health problem facing the nation today." There is a critical need to raise public awareness of the severity of the problem and to garner resources for prevention.

Figure 2: Percent Leading Causes of Injury Deaths, All Ages
N.C. Residents: 2007 (Total Deaths = 6,247)

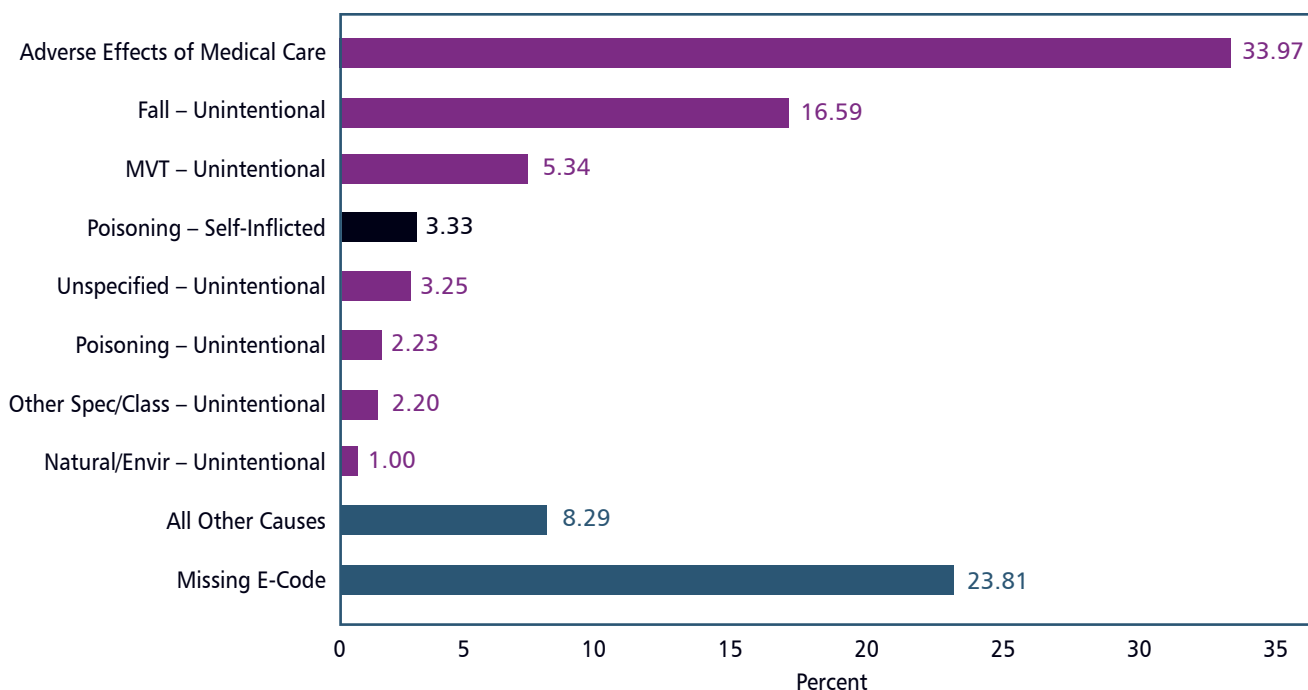


Source: N.C. State Center for Health Statistics, Death file 2007; Analysis by N.C. DPH Injury and Violence Prevention Branch, Epidemiology and Surveillance Unit

Injury deaths from 2007 data are shown in Figure 2. Suicide by firearm was the fourth-leading cause of injury death, while suicide by poisoning is the seventh. Note that suicides by firearm account for a greater percentage of deaths than do homicides by firearm. The second leading cause of injury death is unintentional poisoning, which

includes overdose from prescription drugs. The dramatic rise in poisoning deaths is often of surprise to many people. These death rates increased by more than 180 percent from 1999 (3.53 deaths per 100,000 population) to 2007 (9.94 deaths per 100,000 population).

Figure 3: Percentage of Leading Causes of Injury Hospitalization, All Ages
North Carolina Residents: 2007 (Total Hospitalizations = 154,348)



Source: N.C. State Center for Health Statistics, Death file 2007; Analysis by N.C. DPH Injury and Violence Prevention Branch, Epidemiology and Surveillance Unit

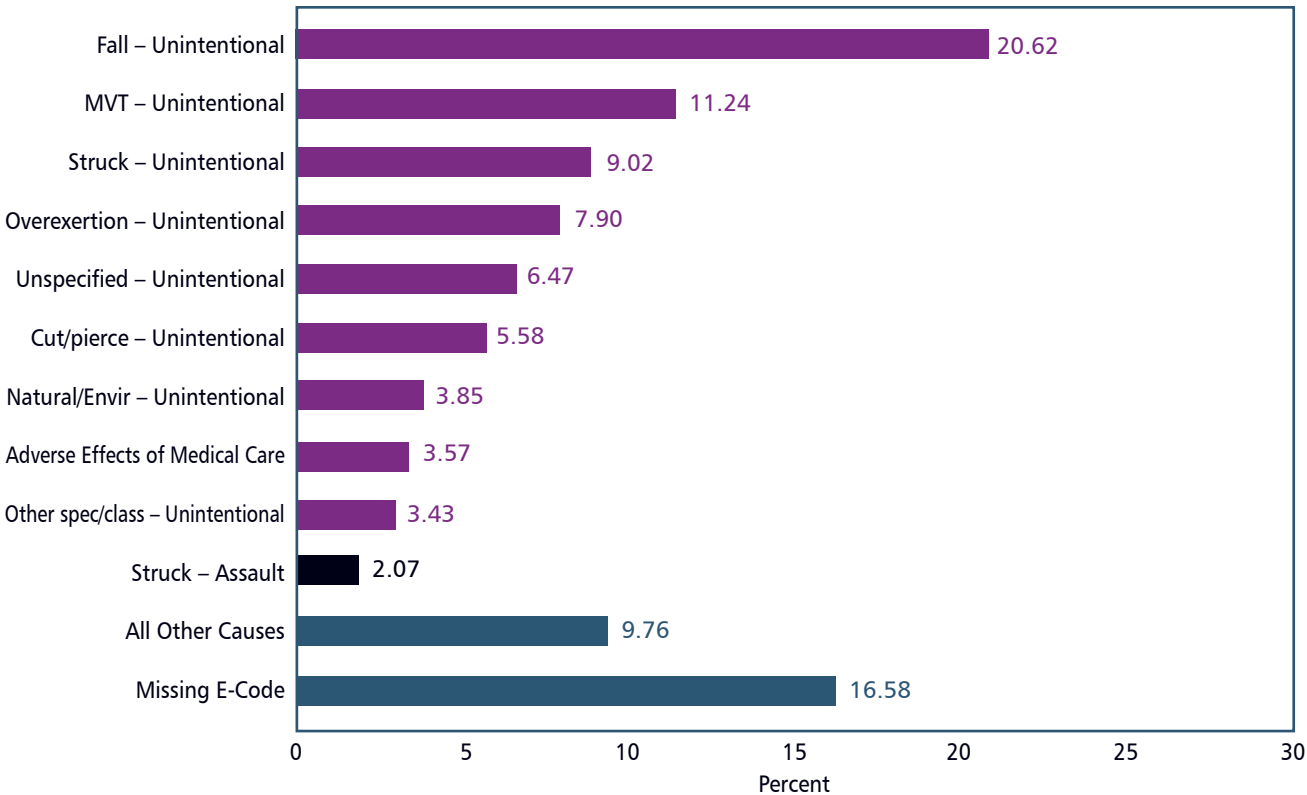
Hospitalizations for injuries in 2007 numbered over 154,000. The leading causes of these hospitalizations are outlined in Figure 3. Adverse effects of medical care, unintentional falls and motor vehicle traffic injuries make up the top three causes of injury hospitalizations. The All Other Causes category includes numerous causes of injury that individually do not account for a large percentage of injury hospitalizations, but when added together make up about 8 percent of hospitalizations caused by an injury.

The category labeled “Missing E-code” means that no external cause or mechanism and intent of injury was assigned for that hospitalization. The high number, 23.81

percent, of missing E-Codes is of concern because it makes it difficult to get an accurate picture of the injury problem. E-codes differentiate causes of a given injury, which is critical information for prevention programming. For example, E-codes indicate whether a concussion was from a motor vehicle crash, a football injury or assault by a domestic partner.

To improve E-coding in North Carolina, it is recommended that there be a mandate requiring E-coding of medical records relating to injuries and electronic capture of the E-code, modification of coding software to encourage detailed coding, adequate training of hospital personnel (especially coders and clinicians), and consideration of periodic validation of E-coding.

Figure 4: Percentage of Leading Causes of Injury Emergency Department Visits, All Ages
North Carolina Residents: 2007 (Total Visits = 812,193)



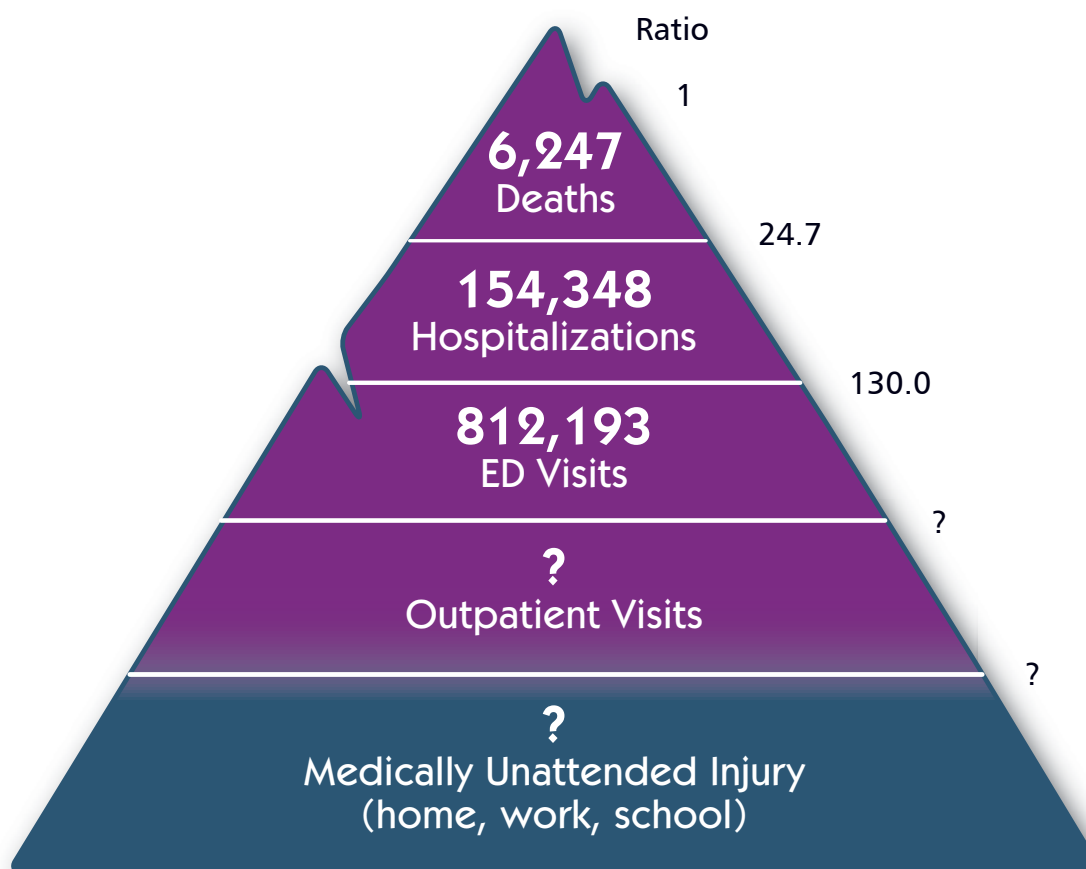
Source: N.C. State Center for Health Statistics, Death file 2007; Analysis by N.C. DPH Injury and Violence Prevention Branch, Epidemiology and Surveillance Unit

Among visits to the emergency department (ED) due to an injury, about one-third of injuries are caused by falls and motor vehicle crashes. The leading causes of ED visits are mostly

unintentional injuries, according to 2007 data. Over 16 percent of cases are missing E-Codes in Figure 4, reinforcing the need for improved data collection methods.

Figure 5: North Carolina Injury Iceberg

North Carolina Residents: 2007



INJURY ICEBERG

Data sources: State Center for Health Statistics, death file 2007; Hospitalizations: State Center for Health Statistics, discharge file 2006; Emergency Department visits: N.C. DETECT, ED file 2007. NC Residents. Analyses conducted by Injury Epidemiology and Surveillance Unit.

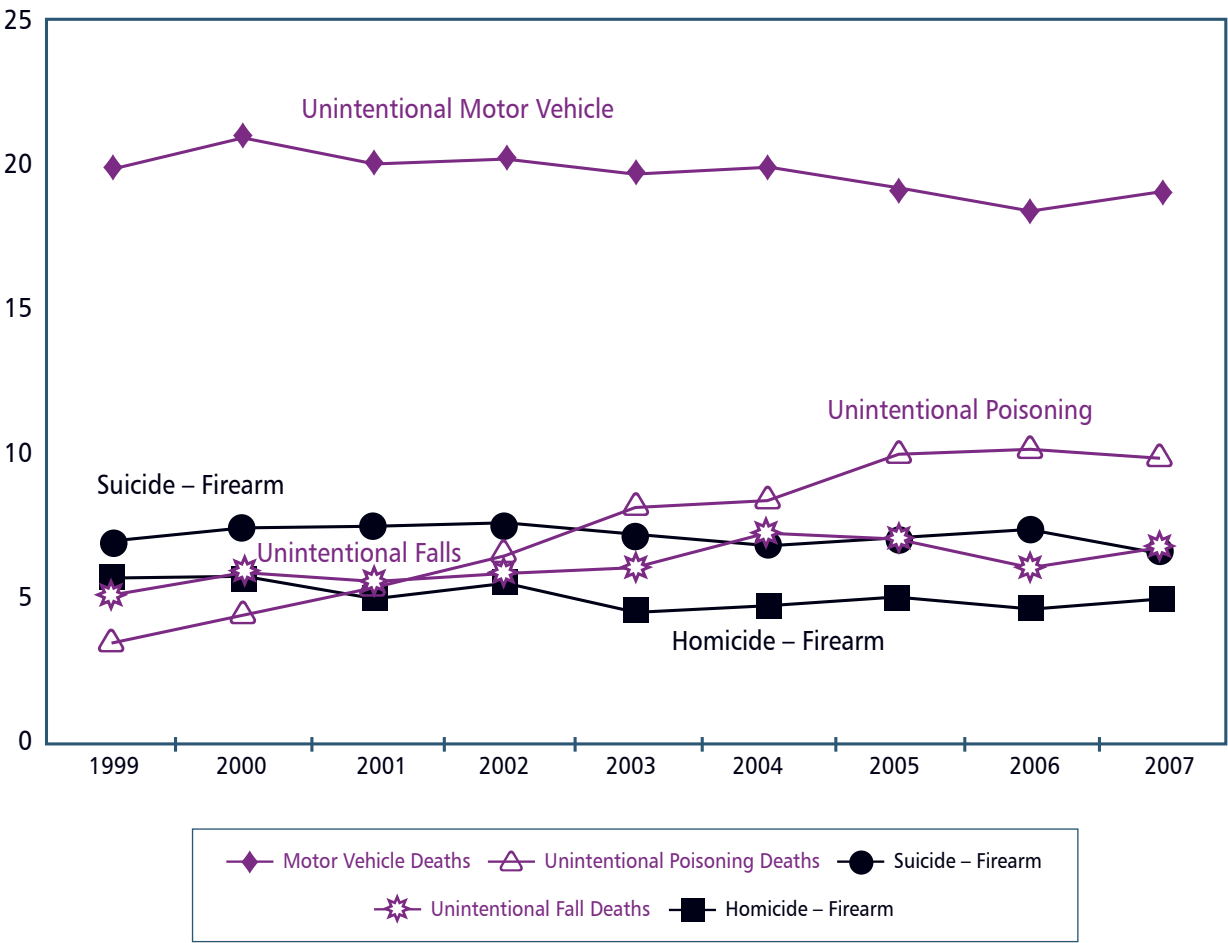
Deaths are only the tip of the iceberg when looking at the overall burden of injury. In Figure 5, the wider levels below deaths represent the large numbers of people who are injured each year as evidenced by hospitalizations, emergency department visits and outpatient visits, as well as medically unattended injuries. While many injuries are defined by mortality rates, injuries also can impair overall health,

causing life-long disabilities and/or psychological effects, and preventing people from living to their full potential. There are question marks for the widest levels of the pyramid because current surveillance systems are unable to capture this information routinely; however, the numbers are estimated to be very large. Every three minutes there is a visit to a North Carolina ED because of a fall injury; however, this metric does not capture

people who fall and then visit their primary care physician or who do not seek any medical attention at all. This gap between reported ED visits and the actual number likely exists in *all*

categories of injury and therefore current data represents a fraction – the tip of the iceberg – of the true burden of injury in North Carolina.

Figure 6: Leading Causes of Injury Death Rates per 100,000
N.C. 1999-2007

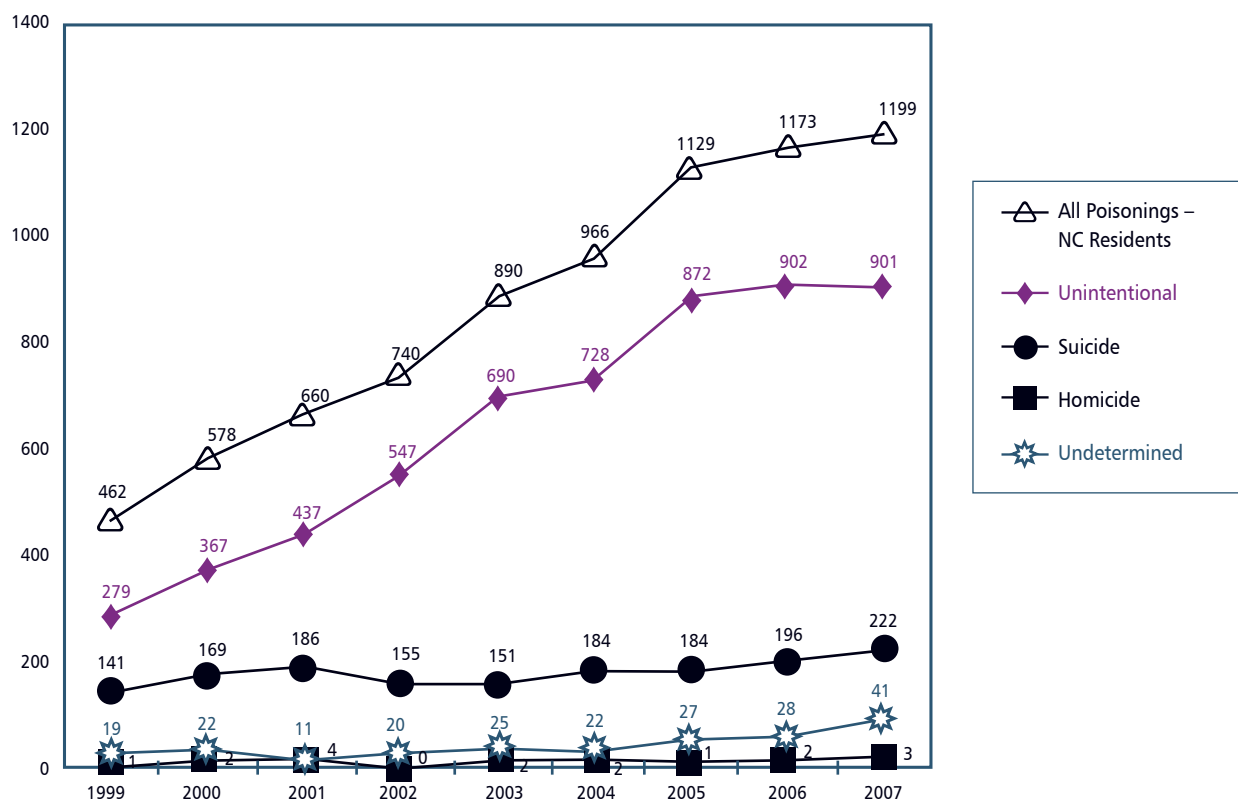


Data sources: Deaths: N.C. State Center for Health Statistics, death file 2007; Analyses conducted by Injury and Violence Prevention Branch, Epidemiology and Surveillance Unit

Trends over time for the five leading causes of injury death from 1999 to 2007 are seen in Figure 6. Unintentional poisonings and unintentional fall injuries have both seen significant increases over this time period.

While there have not been significant changes, rates of suicide, homicide and motor vehicle crashes remain unacceptably high.

Figure 7: Number of Poisoning Deaths by Intent
N.C., 1999-2007



Source: Deaths: N.C. State Center for Health Statistics, Death file 2007; Analysis by N.C. DPH Injury and Violence Prevention Branch, Epidemiology and Surveillance Unit

A seriously under-recognized and misunderstood public health issue is death from unintentional poisonings, the vast majority of which are related to prescription narcotics. Unintentional poisonings are commonly referred to as overdoses. Most of these deaths are not intentional, as can be seen in Figure 7. In 2007, 901 North Carolina residents died as a result of unintentional poisonings. Most of these deaths were related to misuse of painkillers.

Street drugs like heroin and crack cocaine were the overdose epidemics of the 1970s, '80s and '90s. In this decade, a new and growing concern is the misuse and abuse of prescription drugs. Narcotic painkillers such as methadone, oxycodones, and hydrocodones are the cause of the majority of unintentional poisoning deaths in North Carolina.⁴

Fall injuries are of particular concern for people ages 65 and older. According to 2007 data, over three-quarters of fall injury deaths occurred in that age group. Older adult fall injury deaths are only expected to worsen: projections show a "Silver Tsunami" coming to North Carolina over the next decades. In 2000, fewer than 25 of North Carolina's 100 counties had more people over the age of 65 than under the age of 18. Population projections based on July 2006 data show that in 2030 over 75 counties will have more people 65 and older than 18 and younger.

Table 1: 2030 Unintentional Fall Injury Projections for Deaths, Hospitalizations and ED Visits, N.C. Residents, Ages 65+

	2006/2007	Year 2030	% Increase
Deaths	480	947	97.3
Hospitalizations	17,579	35,569	102.3
ED Visits	44,541	87,921	97.4

The effect of this explosion in the older adult population is seen in Table 1. Significant increases are expected for deaths, hospitalizations and ED visits due to unintentional fall injuries. The 2030 count projections are based on fixed 2007 rates for fall injuries. It is expected that this rate will increase as it has for the past several years. Though these numbers, like the 97 percent increase in projected ED visits, are alarming enough, current trends tell us that these are likely conservative estimates. The true numbers will probably be even larger.^{6,7,8,9}

Violence in North Carolina

Violence accounted for 1,785 resident deaths in 2006 in North Carolina. Sixty-two percent of these deaths were due to suicide and 34 percent were due to homicide. The N.C. Violent Death Reporting System (N.C. VDRS) is a CDC-funded state-wide surveillance system that collects detailed information on violent deaths that occur in the state, specifically homicide, suicide, unintentional firearm deaths, deaths from legal intervention, and those deaths where the intent could not be determined. A multi-source system, N.C. VDRS gathers information from death certificates, medical examiner reports and law enforcement reports. The collection of this information has created a better understanding of the circumstances that surround violent deaths occurring in the state. In Table 2, data from the N.C. VDRS are presented, outlining the gender, race and age group of violent death victims in the state in 2006.

Table 2: Gender, Race, and Age Group of Violent Death Victims in N.C., 2006

		Number	%	Rate	95% C.I. for Rate
Gender	Male	1,373	76.9	31.6	29.9 - 33.3
	Female	412	23.1	9.1	8.2 - 10.0
Hispanic	Hispanic	88	4.9	14.9	11.8 - 18.0
	Non-Hispanic	1,697	95.1	20.5	19.5 - 21.5
Race	American Indian	29	1.6	25.5	16.2 – 34.8
	Asian	12	0.7	6.8	2.9 – 10.6
	Black	440	24.7	22.5	20.4 – 24.6
	Pacific Islander	1	0.1	*	*
	White	1,297	72.7	19.6	18.5 – 20.7
	Other	4	0.2	*	
	Unknown	2	0.1	*	*
Age Group (yrs)	< 1	17	1.0	13.2	6.9 – 19.5
	1-4	13	0.7	2.7	1.3 – 4.1
	5-9	9	0.5	1.5	0.5 – 2.5
	10-14	14	0.8	2.4	1.2 – 3.6
	15-19	112	6.3	18.5	15.1 – 21.9
	20-24	213	11.9	34.9	30.2 – 39.6
	25-34	312	17.5	25.7	22.9 – 28.6
	35-44	356	19.9	26.9	24.1 – 29.7
	45-54	350	19.6	27.6	24.7 – 30.5
	55-64	187	10.5	19.2	16.5 – 21.9
	65-74	112	6.3	19.5	15.9 – 23.1
	75-84	64	3.6	17.5	13.2 – 21.8
	85 +	26	1.5	19.2	11.8 – 26.6
Total Deaths		1,785	100		

Source: N.C. Violent Death Reporting System, Annual Report 2006, N.C. DPH Injury and Violence Prevention Branch, Epidemiology and Surveillance Unit

C.I. = Confidence interval

Note: Asterisk indicates numbers were too small to calculate a rate.

The data indicate that violent death is concentrated among certain populations.

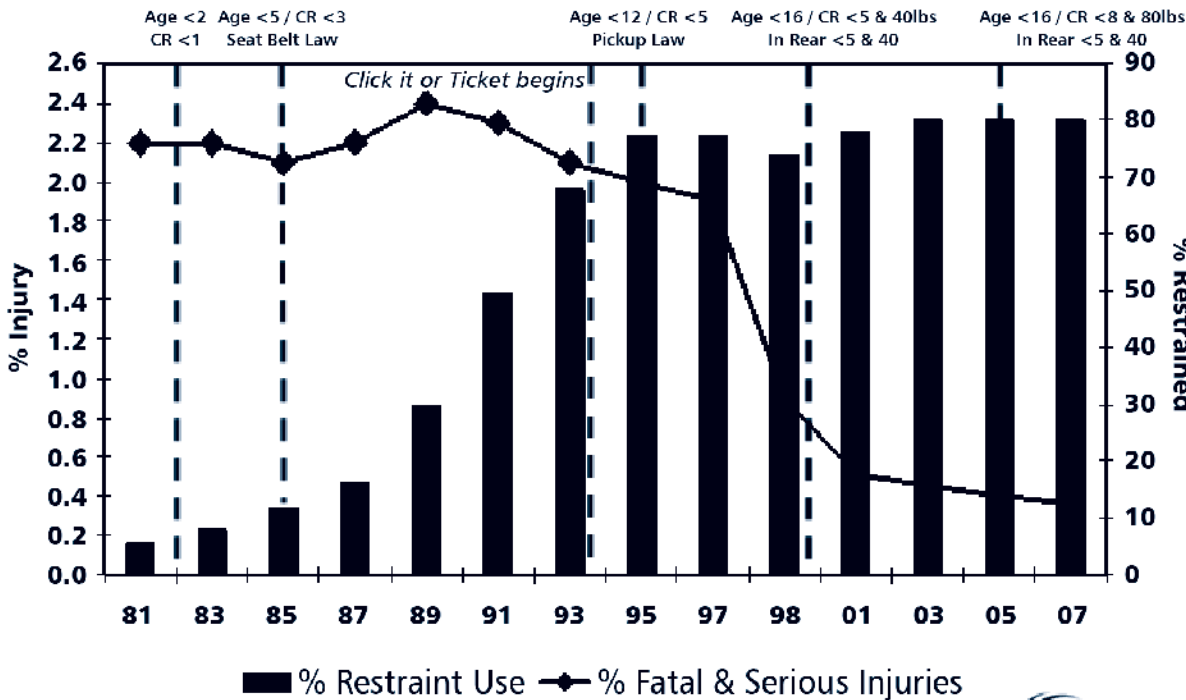
- Men are three times more likely to die a violent death than women.
- Violent death rates are highest among American Indians and African Americans.
- People between the ages of 20 and 24 experience the highest rate of violent death.
- Infants (under age 1) have the highest rate of violent death among all children under 15.

Policy Interventions and Reducing the Burden of Injury

Policy at the state, local or organizational level can be a very effective tool for preventing

injuries and saving lives. Policies, such as requiring childproof tops on pill bottles and cigarettes to be self-extinguishing, have prevented many poisonings and burn injuries. Other well known examples of injury prevention policy successes include child passenger restraint and Graduated Drivers License (GDL) system policies. Injuries in children ages 0 to 15 related to motor vehicle crashes have seen sharp declines since the enactment of child restraint laws starting in the early 1980s. Analysis by the University of North Carolina Highway Safety Research Center shows the steady increase in observed restraint use corresponds with the decline in injury rates in children (Figure 8).

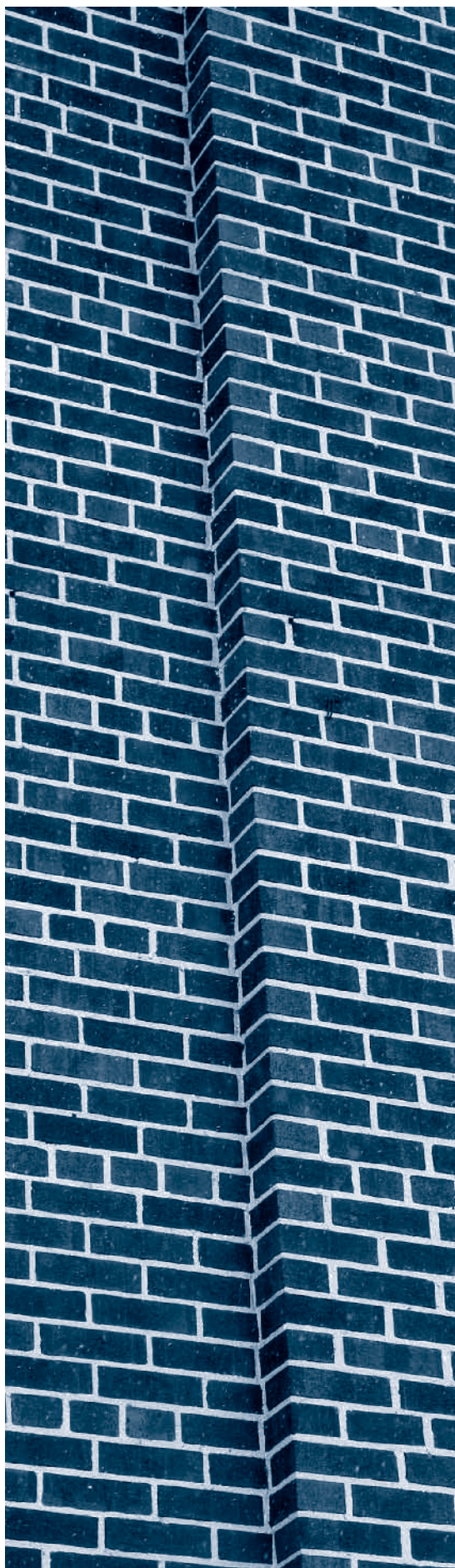
Figure 8: Estimated Restraint Use* and Injury Rates for Children Ages 0-15 in North Carolina Crashes 1980-2007



■ % Restraint Use ◆ % Fatal & Serious Injuries
 *Restraint use estimates based on observed restraint use

Prepared by the UNC Highway Safety Research Center – Revised: February 16, 2009





Motor vehicle crashes are the leading cause of death among teenagers. A combination of inexperience and the natural impulsiveness of the adolescent years contribute to this increased risk of being involved in a crash. An effective intervention to address this problem is the GDL system that went into effect in North Carolina on December 1, 1997. From 1996 to 1999, fatal 16-year-old driver crashes declined 57 percent. Crashes at night were 43 percent less likely, and daytime crashes decreased by 20 percent. Follow-up analyses of crash data through 2005 indicate that the crash rate has remained at this much lower level, with no evidence of any erosion of the benefits of this new approach to licensing.¹⁰